REMARKS

Claims 13, 14, 42, and 44 have been amended. Claims 13, 14, 16, 17, 42 and 44-48 are now pending. Claim 44-48 have been withdrawn as being directed to a non-elected invention. Applicants reserve the right to pursue the original claims and other claims in this and other applications. A Request for Continued Examination is being concurrently filed herewith. Please reconsider the above-referenced application in light of the foregoing amendments, concurrently-filed RCE, and following remarks.

At the outset, Applicants respectfully submit that independent claim 44 has been amended to recite a method comprising, *inter alia*, "depositing a dielectric film over a semiconductor substrate *to form part of a gate of a transistor*." (emphasis added). Applicants elected Group I, drawn to a method of forming part of a gate of a transistor, which included claims 13, 14, 16, 17, and 42 on January 5, 2004. Claims 44-48 are now also drawn to a method of forming a part of a gate of a transistor. Consequently, Applicants respectfully request that claims 44-48 be examined along with 13, 14, 16, 17, and 42.

Claims 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,891,809 ("Chau") in view of U.S. Patent No.: 5,618,349 ("Yuuki"). The rejection is respectfully traversed.

Claim 13 has been amended to recite a method comprising, *inter alia*, "depositing a dielectric film . . . subjecting the dielectric film to a densifying treatment to stabilize said film . . . at a *first temperature*; and subjecting said stabilized dielectric film to a wet oxidation with steam process . . . at a *second temperature* . . . said steam being carried to the chamber, wherein the first and second temperature of said chamber is from approximately 450°C to about 1050°C, wherein said film is subjected to said process for a duration of about 20 seconds to about 60 seconds, wherein the ratio of

steam to other gases in the chamber is in the range from about 0.1 to about 0.5 and the pressure of said rapid thermal process chamber is held at about atmospheric pressure, and *wherein said first temperature is greater than said second temperature*." (emphasis added).

The cited references do not disclose or suggest a dielectric film subjected to a wet oxidation with steam process for a duration of about 20 seconds to about 60 seconds, much less that the first temperature of the densifying treatment is greater than the second temperature of the wet oxidation with steam process.

For example, in Chau, a wet or steam oxidation is performed as step 125. Step 125 "is carried out at a temperature of 750°C., for a time of *13 minutes*," when an oxide layer of 53 Å is desired (Col. 4, ll. 61-63) (emphasis added). When an oxide layer of 35 Å is desired, "the step is carried out a temperature of approximately 725°C, for a time of approximately *5.5 minutes*." (Col. 4, ll. 65-67) (emphasis added). When an oxide thickness of 27 Å is desired, the "step is carried out at a temperature of 725°C., for a time of *3 minutes*." (Col. 5, ll. 1-3) (emphasis added). Consequently, Chau discloses a wet or steam oxidation time that is at *least three times longer* than Applicants' claimed "duration of about 20 seconds to about 60 seconds," as recited in claim 13.

Further, since Chau discloses that step 120 is conducted at a temperature of 725°C. or 750°C., *and* step 125 (wet oxidation) is *also* carried out at a temperature of 725°C. or 750°C., Chau does *not* disclose or suggest that the first temperature of the densifying treatment *is greater* than the second temperature of the wet oxidation with steam process.

Further still, Chau steps 120 and 125 are *not* carried out in a rapid thermal process chamber but a *furnace cycle* (Col. 2, ll. 45-46). Chau discloses that the substrate is put through the RTP cycle only *after* step 140 is completed (FIG.2). For example, in FIG. 3, the wafers are *now* loaded into the RTP system (Col. 6, ll. 3-4) *after* step 140. As a result, Chau does not disclose a wet oxidation with steam process in a rapid thermal process chamber.

Yuuki is relied upon for disclosing a pyrogenic oxidation of silicon substrates carried out at atmospheric pressure, and adds nothing to rectify the deficiencies associated with Chau. Claim 14 depends from claim 13 and should be similarly allowable along with claim 13 for at least the reasons provided above, and on its own merits.

Claims 13, 14, and 16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,066,581 ("Chivukula") in view of U.S. patent application pub.: 2002/0004248 A1 ("Lee"), and Van Zant, Microchip Fabrication, 3rd ed., pp. 149-150 (1997) ("Van Zant I"), and considered with CRC Handbook of Chemistry and Physics 63rd Edition, CRC Press, pp. D-196 to D-197, for a showing of inherency only. The rejection is respectfully traversed.

The cited references do not disclose or suggest subjecting a dielectric film to a densifying treatment to stabilize said film at a first temperature, and subjecting the stabilized dielectric film to a wet oxidation with steam process at a second temperature, wherein the first temperature is greater than the second temperature.

This fact is underscored by the Office Action's acknowledgment that Chivukula discloses "a densifying treatment to stabilize said dielectric film by heating the semiconductor substrate at 100°C and then again at 350-400°C." (Office Action, pg.

6). Then, the Office Action states that Chivukula discloses a wet oxidation with steam process "at a temperature of 450°C to 800°C." (Office Action, pg. 6). Consequently, Chivukula teaches *away* from a densifying treatment, prior to wet oxidation, having a *higher temperature* than the wet oxidation with steam process's temperature.

Van Zant I is relied upon for disclosing that atmospheric pressure is used, and Lee is relied upon for disclosing forming a dielectric film as part of a gate of a transistor. Both references add nothing to rectify the deficiencies associated with Chivukula.

As such, the cited references, alone or in combination, fail to teach or suggest a method comprising, *inter alia,* "depositing a dielectric film . . . subjecting the dielectric film to a densifying treatment to stabilize said film . . . at a *first temperature*; and subjecting said stabilized dielectric film to a wet oxidation with steam process . . . at a *second temperature* . . . said steam being carried to the chamber, wherein the first and second temperature of said chamber is from approximately 450°C to about 1050°C, wherein said film is subjected to said process for a duration of about 20 seconds to about 60 seconds, wherein the ratio of steam to other gases in the chamber is in the range from about 0.1 to about 0.5 and the pressure of said rapid thermal process chamber is held at about atmospheric pressure, and *wherein said first temperature is greater than said second temperature,*" as recited in claim 13 (emphasis added).

Claims 14 and 16 depend from claim 13 and should be similarly allowable for at least the reasons provided above with regard to claim 13, and on their own merits.

Claims 13, 14, and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No.: 6,136,728 ("Wang") in view of U.S. Patent No.: 6,114,258 ("Miner"), and Van Zant I. The rejection is respectfully traversed.

The Office Action asserts that Wang discloses a wet oxidation with steam process in a rapid thermal process chamber at temperatures greater than 450°C. Applicants respectfully direct the Examiner's attention to Col. 3, ll. 56-60. Wang merely discloses a "WVA [wet vapor anneal] step in a *standard* steam oxidation furnace . . . The *furnace tube* which was at 380°C and the total WVA anneal time of 30 minutes." (Col. 3, ll. 56-60). Wang does *not* disclose or suggest a wet oxidation with steam process carried out in a rapid thermal process chamber, but rather the use of a *furnace tube*. Wang does *not* disclose or suggest a wet oxidation with steam process time of 20 to 60 seconds, but rather an anneal time of *30 minutes*.

The Office Action asserts that Wang discloses temperatures greater than 450°C for the WVA process and cites Col. 5, ll. 4-10 as support. Applicants respectfully submit that Wang, in fact, discloses the opposite. Wang's Col. 3, ll. 59-60 teaches that a temperature of 380°C is used. Wang discloses that "the best results occurring at 380°C," and thus, teaches away from using temperatures greater than 450°C (Col. 5, l. 5).

The Office Action relies upon Miner for disclosing that the ratio of steam relative to other gases in the chamber overlaps Applicants' claimed range of 0.1 to 0.5 and Van Zant I for atmospheric pressure. Both references add nothing to rectify the deficiencies associated with Wang.

Applicants respectfully submit that there is no motivation to combine Wang and Miner. Wang discloses a "WVA [wet vapor anneal] step [is performed] in a standard steam oxidation furnace . . . [and that] *[t]he furnace tube* which was at 380°C and the total WVA anneal time was about 30 minutes. " (Col. 3, lines 56-58) (emphasis added). Wang's water vapor is provided "by using an infra-red lamp to heat up a tank of *deionized* (DI) water that was connected to the tube. The heated DI water evaporated

and flowed through the [furnace] tube and over the devices that were being annealed." (Col. 3, lines 60-65) (emphasis added). In other words, Wang uses *deionized* water evaporated to form steam, a furnace tube, and an anneal time of 30 minutes.

Miner, in contrast, discloses a RTP apparatus 200 and *not* a furnace tube. Miner discloses that hydrogen and oxygen gas are combined *in the reaction chamber* at a pressure less than 150 Torr to make steam (Col. 8, lines 58-65). It is *not* evaporated deionized water. Miner further discloses that the wafer is "held at process temperatures for between 30 to 120 seconds." (Col. 10, lines 3-4). It is *not* an anneal time of 30 minutes. Wang and Miner disclose completely different processes as evidenced by the huge variance in time, processing apparatus, and methods of forming water. There is no motivation to combine such disparate processes.

As such, the cited references, alone or in combination, fail to teach or suggest a method comprising, *inter alia*, "depositing a dielectric film . . . subjecting the dielectric film to a densifying treatment to stabilize said film . . . at a *first temperature*; and subjecting said stabilized dielectric film to a wet oxidation with steam process . . . at a *second temperature* . . . said steam being carried to the chamber, wherein the first and second temperature of said chamber is from approximately 450 °C to about 1050°C, wherein said film is subjected to said process for a duration of about 20 seconds to about 60 seconds, wherein the ratio of steam to other gases in the chamber is in the range from about 0.1 to about 0.5 and the pressure of said rapid thermal process chamber is held at about atmospheric pressure, and *wherein said first temperature is greater than said second temperature*," as recited in claim 13 (emphasis added).

Claims 14 and 17 depend from claim 13 and should be allowable along with claim 13 for at least the reasons provided above, and on their own merits.

Claim 42 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Chivukula in view of Van Zant, Microchip Fabrication, A Practical Guide to Semiconductor Processing, 3rd ed., pp. 157-160 (1997) ("Van Zant II"). The rejection is respectfully traversed.

Claim 42 has been amended to recite a method comprising, *inter alia*, "depositing a dielectric film . . . subjecting the dielectric film to a densifying treatment . . . at a temperature greater than about 700°C; and subjecting the dielectric film to a wet oxidation with steam process . . . by heating a mixture of hydrogen and oxygen gases . . . at a temperature greater than about 450°C . . . [in] a ratio from 0.1 to approximately 0.80 of hydrogen gas to oxygen gas and combined in said rapid thermal process chamber, and said rapid thermal process chamber has a pressure of around 1 millitorr." (emphasis added).

As indicated above, which was acknowledged by the Office Action, Chivukula discloses "a densifying treatment to stabilize said dielectric film by heating the semiconductor substrate at 100°C and then again at 350-400°C." (Office Action, pg. 6). Then, Chivukula discloses a wet oxidation with steam process "at a temperature of 450°C to 800°C." (Office Action, pg. 6). Consequently, Chivukula teaches *away* from a densifying treatment having a higher temperature than the wet oxidation with steam process's temperature. As such, Chivukula does not teach or suggest the subject matter of amended claim 42. The Office Action relies upon Van Zant II for disclosing a dry oxidation system that forms steam ("Dryox"), and adds nothing to rectify the deficiencies associated with Chivukula.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to review and pass this application to issue.

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Respectfully submitted,

By

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